REMARKS

Claims 1-5 and 11-20 are currently pending in this application. By this response to the non-final Office Action dated October 30, 2008, claims 1, 5, 11, 15, 16, and 20 are amended. Support for the amendments is found in the specification and claims as filed. No new matter has been introduced. Favorable reconsideration of the application in light of the foregoing amendments and following comments is respectfully solicited.

I. Rejection Under 35 U.S.C. § 112, First Paragraph

On page 2 of the Office Action, claims 1-5 and 11-20 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Applicants respectfully traverse.

The Office Action asserts the claims are not enabled because "[t]here is no description within the specification that would enable one of ordinary skill in the art to implement a virtual/computer simulated surface in the actual brain." Amended independent claims 1, 11, and 16 each recite "setting, in a computer simulation of the brain, a plurality of computer simulated curved surfaces." This is disclosed, for example, in FIG. 3 of this application. Applicants respectfully submit that the claims comply with the requirements of Section 112, and request withdrawal of the rejection.

II. Rejection Under 35 U.S.C. § 101

On page 2 of the Office Action, claims 1-5 were rejected under 35 U.S.C. § 101 as being directed to nonstatutory subject matter. Applicants respectfully traverse.

Shortly after issuance of the Office Action, the test for determining the patent eligibility of a process or method recently changed, and is not reflected in the current basis of rejection. *In re Bilski*, 545 F.3d 943 (Fed. Cir. 2008). Under the new "machine or transformation test," a process claim satisfies Section 101 if, *inter alia*, the claim transforms an article. Although physical objects or substances are a primary example of an "article," the Federal Circuit further explained that transformation of data is sufficient to render a process patent-eligible if the data represents physical and tangible objects. *Bilski*, at 946. The Federal Circuit specifically rejected the "useful, concrete, and tangible result" inquiry of State Street Bank which the Office Action appears to rely on (*see* Office Action, page 2 ("The claim limitations are directed towards a method that does not produce a tangible result") (*emphasis added*)).

Claim 1 recites a transformation of data representing physical and tangible objects that satisfies the test for patent eligibility set forth in *Bilski*. Specifically, the claimed method transforms a particular type of data, an electromagnetic field observed outside the scalp, into a position of a current source. This data is representative of physical and tangible objects – current sources within the brain. In the last response Applicants noted the similarity, from the perspective of patent eligibility, between the claims and the *Abele* case. *Abele* was specifically noted favorably by the Federal Circuit as a case which is exemplary of patent eligible claims which transform data. Although the *Abele* case displayed x-ray attenuation data, such display of data is not necessary to accomplish an eligible transformation, but is merely an *example* of a sufficiently eligible transformation. Instead, as explained by the Federal Circuit, the recited transformation "must be central to the purpose of the claimed process" (*Bilski*, at 962), as is the case with respect to claim 1.

As claim 1 is directed to a patent eligible transformation of data representing physical and tangible objects in accordance with the test set forth in *Bilski*, claims 1-5 are eligible subject matter under Section 101. Thus, Applicants respectfully request withdrawal of the rejection under Section 101.

III. Rejection Under 35 U.S.C. § 103(a)

On page 3 of the Office Action, claims 1-5 and 11-20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tucker (U.S. Patent No. 6,594,521) in view of Baillet et al. (NPL – "A Bayesian Approach to Introducing Anatomo-Functional Priors in the EEG/MEG Inverse Problem"). Applicants respectfully traverse.

A. The cited art does not render obvious the recited identifying "one computer simulated curved surface among [a] plurality of computer simulated curved surfaces"

Independent claims 1, 11, and 16 each recite, inter alia, identifying "one computer simulated curved surface among [a] plurality of computer simulated curved surfaces." In embodiments of the above limitations, the depth of the current source can be estimated. In contrast, in Tucker, the surfaces where dipoles exist are fixed ones.

Page 3 of the Office Action asserts that a portion of claim 1 and col. 4, lines 32-40 teach the use of a plurality of curved surfaces and identification of a curved surface, as recited in the claims. However, Tucker neither discloses or suggests the recited use of computer simulated curved surfaces set in a computer simulation of a brain.

Tucker, col. 1, lines 37-55 explains that the head can be divided, from the viewpoint of cerebral organization, into the scalp, the skull, the cerebrospinal fluid, and the brain, and these regions have conductivity/impedance different from each other. *See* Tucker, col. 1, lines 37-41.

Therefore, a method of dividing these regions into four concentric regions and employing a model assuming different conductivity/impedance for each region is proposed. This is a method currently normally performed in current source estimation, and it relates to leadfield calculation for calculating electromagnetic field generated in an MEG or EEG sensor when a current is generated in the brain, which is a preliminary step toward current source estimation addressed in the subject application. According to Tucker, in order to more accurately describe not current sources but conductivity/impedance characteristics in the head, detailed shape of the scalp, the skull, the cerebrospinal fluid, and the brain can be derived based on MRI.

Although Tucker, col. 3, lines 29-41 discusses a "body model . . . assuming . . . a small number of concentric shells of the differing tissue types," as discussed above, the disclosed "small number of concentric shells" refers to shells obtained by modeling a boundary surface of the scalp, the skull, the cerebrospinal fluid, and the brain. However, even if these concentric shells were equated with the recited "curved surfaces," Tucker does not disclose identifying "one computer simulated curved surface among [a] plurality of computer simulated curved surfaces," as recited in the claims. Although Tucker, col. 3, lines 34-38 explains that in order to more accurately model electrical characteristics the head may be divided into smaller regions and different conductivity/impedance for each region should be assumed, much as with the use of MRI discussed above, the disclosure relates to not more accurately describing current sources, but instead conductivity/impedance characteristics in the head. Thus, Tucker does not relate to the claimed subject matter.

As Tucker fails to disclose or suggest identifying "one computer simulated curved surface among [a] plurality of computer simulated curved surfaces," as recited in the claims, and Baillet fails to bridge this gap between the claims and Tucker, the claims are nonobvious in view

of the cited art, Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 103.

B. The cited art does not render obvious the recited "setting . . . a hierarchical prior distribution representing a localized condition of [a] current source in [a] variational Bayesian estimation

Page 4 of the Office Action acknowledges that "Tucker does not specifically teach the particulars of estimating on each of said virtual curved surface, a current distribution for recovering said electromagnetic field." Seeking to bridge this gap, the Office Action relies on Baillet. However, Baillet fails to bridge the gap acknowledged by the Office Action.

In Baillet, a spatial continuous condition and a temporal continuous condition of a current are introduced as a priori information for Bayesian estimation. In contrast, in embodiments of claims 1, 11, and 16, spatial localization of an estimated current is enhanced by introducing a (spatial) localized condition in addition to a spatial continuous condition.

Bayesian estimation used in Baillet is maximum a posteriori (MAP) estimation for estimating an optimal current parameter maximizing a posteriori probability distribution. It is now known that, when maximum likelihood estimation or MAP estimation is applied to a problem where the number of parameters (*e.g.*, the number of cortical currents to be estimated) included in an estimation model is much greater than the number of pieces of data (*e.g.*, the number of sensors), such as a current source inverse estimation problem, estimation accuracy becomes poorer in proportion to the number of parameters.

On the other hand, the hierarchical Bayesian estimation method recited in the claims estimates not an optimal parameter but a distribution function form of parameter posterior probability distribution by using a variational Bayesian method. An estimated current is obtained by performing parameter integration with a weight of posterior probability distribution.

Therefore, a value of an excessive parameter not contributing to description of data attains to zero and an excessive degree of freedom of parameter is automatically lowered, so that estimation accuracy can be improved. Actually, it has been shown by recent studies of statistical mathematics that the variational Bayesian method is superior in terms of principles to the MAP estimation method for addressing an ill-posed problem excessively including parameters. *See, e.g.*, Kazuho Watanabe, Sumio Watanabe, "Stochastic complexities of gaussian mixtures in variational bayesian approximation," Journal of Machine Learning Research, Vol. 7, pp. 625-644, 2006.

As Baillet does not disclose use of a variational Bayesian method in the manner recited, and Tucker does not bridge this gap between the claims and Baillet, the claims are nonobvious in view of the cited art. Thus, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 103.

C. The Office Action has not established a prima facie case of obviousness against claims 3-5, 13-15, and 18-20

Pages 3-4 of the Office Action, setting forth the basis for rejection of the claims under 35 U.S.C. § 103(a), only appears to address limitations recited in claims 1 and 2. However, the Office Action does not address any, or at least all, of the limitations recited in dependent claims 3-5, 13-15, and 18-20. Thus, the Office Action has not established a *prima facie* rejection of these claims under Section 103(a). Accordingly, Applicants respectfully request withdrawal of the rejection of claims 3-5, 13-15, and 18-20.

D. The cited art does not render obvious claims 5, 10, and 20

Claims 5, 10, and 20 each recite, *inter alia*,

> setting the hierarchical prior distribution using observation data obtained by other observation method independent of said observation of electromagnetic field for said estimation of the current source.

This application describes an embodiment of the above limitations, in which current source estimation accuracy is enhanced with MEG, by indirectly providing fMRI information as hierarchical prior information for average intensity of the current source. Here, as the fMRI information is used as a soft constraint, it has robustness against noise included in the fMRI information. The cited art does not disclose or suggest the limitations of claims 5 and 10.

IV. Conclusion

Accordingly, it is urged that the application, as now amended, is in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, Examiner is requested to call Applicant's attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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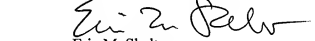

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